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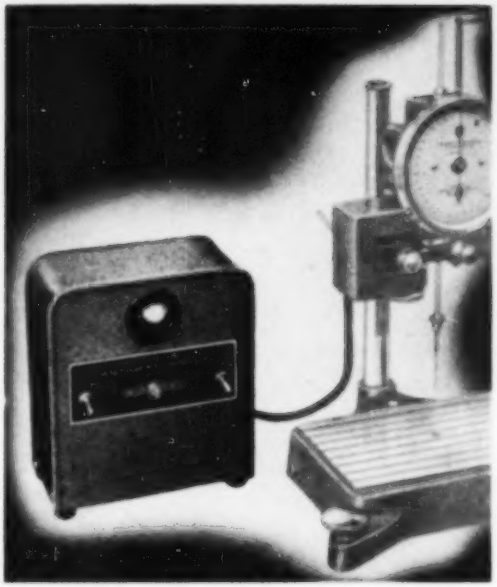

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ABOUT THE COVER

Attractive full color lithography on Inland 100-Pound Grease Drums provides a particularly effective and low cost method of product advertising at garages, service stations, etc. Because of their sturdy construction, colorfully lithographed sales message and convenient styles of opening, these drums are now accepted as a standard container for packing 100 pounds of grease. There are five types of covers and openings available with the Inland 100-Pound Grease Drums. They are provided with ¼" bushings—4 or 5 as specified—to fit standard grease pump attachments. Extra 2" threaded openings may be forced in the cover and ¾" in the body of any of these drums.

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For packing and shipping grease in large quantities, Inland E-Z Seal barrels with a No. 8 lug cover or No. 4 or 4K bolted covers are available. For smaller quantities of grease, the Inland Steel Container Company developed its Inland "Kleen-Fil" Grease Gun Filler Pail which provides, in addition to an ideal ship-

(Continued on page 22)

President's page

by Howard Cooper, President, N.L.G.I.

LUBRICATING GREASE IN NATIONAL DEFENSE

Military authorities, politicians and the daily press continually stress the strategic value of petroleum as a munition and a defense necessity. This emphasis stems principally from the great volume demand for petroleum fuels for all classes of military equipment, from battleships and the unsatiable appetite of jet propelled planes, to portable field generating sets.

Some recognition is also given to petroleum as a base material for synthetic rubber, strategic chemical by-products, textile fibers, and vital plastics. However, other derivatives, such as lubricants, are accorded less publicity; yet the fuels, and other products formulated from petroleum fractions are useless without the lubricants made from the same crude petroleum.

Those people who perhaps may recognize lubricants as essential to the functioning of a military or defense machine hardly can be expected to perceive the multitude of different requirements to be met, and the exactitude of the demands. They may visualize turbine oils for the propulsion of Navy vessels, lubricating oils for aircraft, and automotive lubricants for the Army's trucks and tanks; but they are unaware of the highly specialized lubricants required for ordnance fire control mechanisms, delicate instruments, aircraft control systems, and for numerous extremely important though small consumption applications.

Moreover, such thought as is accorded lubricants seldom penetrates to embrace the field of lubricating greases; yet lubricating g ease has a part in the drama which can be played by no substitutes or alternates. There are applications for which only lubricating grease is adaptable; in other instances lubricating grease is preferred for reliability and to better assure quick response and positive action of precision mechanisms. For some operating requirements only lubricating grease may be able to provide such valuable advantages as retention in bearing housings without leakage, reduced frequency of servicing, and assured lubrication through extreme ranges of temperatures.

The lubricating grease industry, of course, realizes the part it must play in military and defense activities, and understands the vital importance of perfection of performance and reliability of the products it produces. Cooperation with the military services, and research are continuous; and as improvements in lubricating greases are developed, designers of equipment are enabled to provide more effective and more reliable mechanisms for the better defense of universal freedom and American lives.

The anxious desire in the lubricating grease industry to understand the conditions and operating requirements of exacting military mechanisms, the striving to provide lubricants of greater reliability, the willingness to expend money and time in research—all in the interest of greater national defense and military strength—are a reflection of loyalty and patriotism, integrity and trustworthiness in an important, yet somewhat unsung segment of the broad petroleum industry—the lubricating grease manufacturers. These qualities are a modern exemplification of the standard of loyalty, patriotism and integrity that historians proclaim for our great first and 16th presidents—George Washington and Abraham Lincoln—whose birthdays are commemorated in this month of February.

North American B-45 Tornado. The B-45 was the first four-jet plane to fly in the United States. The four J-47 engines are arranged in pairs in single nacelles on each wing. Each engine has a thrust of 5,200 pounds. This plane has a wingspan of 89 feet, is 75 feet long, and is 25 feet high. It can carry a bomb load of over 10 tons and is in the 550 mile per hour class. Crew for this aircraft is a four-man team housed in a pressurized cabin.

—USAF Air Material Command Photographs

Wright-Patterson Air Force Base, Dayton, Ohio

EVALUATION AND USE of Synthetic Greases

by E. M. GLASS
B. RUBIN
Air Materiel Command

SUMMARY

To summarize, the Air Force and the Navy Bureau of Aeronautics have gradually been displacing petroleum greases with synthetic greases for aircraft applications in order to keep pace with more stringent design requirements, while at the same time keeping the number of lubricants required for the periodic lubrication of aircraft to a minimum. We now have almost three years of field experience with these greases and their performance under field conditions has been extremely gratifying. Present and future design requirements of aircraft equipment, however, emphasize the need for added efforts towards the development of wider temperature range greases than are now available. The goals have been established and we know that the grease manufacturers will accept the challenge.

HISTORICAL

The first use of a synthetic grease in an aircraft application was authorized by the Air Force during the latter part of 1944*. It involved the lubrication of fractional horsepower motor bearings of the AN/APQ-7 radar antenna used in the B-17 and B-24 airplanes. The grease used consisted primarily of a lithium soap as the gelling agent and di-(2-ethyl hexyl) sebacate as the synthetic oil component. The use of this novel grease was dictated by design considerations. In order to meet the stringent weight and space requirements of the antenna, it was necessary to use comparatively high speed and hot running fly-power motors with exceedingly low available torque. Tests conducted at that time showed it to be impossible to prepare petroleum greases of the AN-G-15 and AN-G-3a types which would be satisfactory at extremely low temperatures (—65 F.) and yet be capable of exhibiting satisfactory performance characteristics at high temperatures (250 F.). Thus, the use of a grease containing a synthetic oil component became necessary.

Since this inauspicious beginning, the use of synthetic greases has gradually increased as new designs were conceived and placed into production. Because of the limited supply of the diesters, synthetic greases of this type were relegated for some time to small volume applications such as fractional horsepower motors, electric driven gyro instruments or to other applications where a grease with excellent low and high temperature properties were required.

Specification AN-G-25 was issued April 10, 1946, by the USAF and the Navy Bureau of Aeronautics at which time the critical shortage of diesters appeared to have eased considerably. With the issuance of this specification, consideration was given to the use of AN-G-25 greases in all applications where specification AN-G-3a was then specified. This was believed desirable particularly in view of the large number of field reports received on bearing corrosion, liquifaction, bleeding and oil evaporation with AN-G-3a greases. These difficulties resulted to a great extent from the use of low viscosity petroleum fractions in this grease in order to meet the low temperature requirements.

By March, 1948, all aircraft in service and all aircraft being manufactured for the USAF were using AN-G-25 grease for initial and periodic lubrication. Since that time, the synthetic greases conforming to specification AN-G-25 have not only completely displaced petroleum greases of the AN-G-3a type, but also a large number of the applications where AN-G-15 greases were formerly specified. The only reason that all of the AN-G-15 applications have not been changed over has been the deleterious effect of the synthetic oil on rubber, paints and electrical insulating materials. When improved rubber and paint-like materials can be developed and placed into use, the remaining AN-G-15 applications will be changed over rapidly. A review of the more important requirements of these three greases in Table 1 shows how this has been possible.

• The opinions expressed are those of the authors and do not necessarily represent the official opinion of the USAF or the Air Force Materiel Command.

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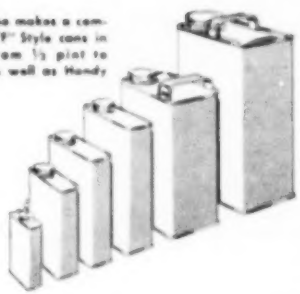

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Grease manufacturers should take pride in the fact that due to this advancement in grease technology, the Air Services have been able to simplify field relubrication to a point where only one grease, AN-G-25, is required for the *periodic* lubrication of such familiar aircraft as the F-80, F-84, F-86, F-93, B-50 and C-97 airplanes. The hopes expressed not too long ago[1] for a universal grease for the field relubrication of aircraft are rapidly approaching reality. We cannot rest on our laurels, however. The designers of aircraft equipment have learned to take advantage of the improved performance characteristics of the AN-G-25 type greases and the margin of safety we now enjoy is gradually being eliminated and in many cases is non-existent. New and unusual greases are required which can be used over wider temperature ranges and under conditions of higher specific speeds and loads.

Let us review at this time our past experiences with synthetic greases, some of the improvements made on the basis of service use and what the future needs appear to be for such materials.

SYNTHETIC GREASES IN CURRENT USE

Greases made with diesters containing more than 20 carbon atoms have assumed, as previously noted, great importance in aircraft lubrication. All producers with one exception have used di-(2 ethyl hexyl) sebacate as the base oil for the AN-G-25 formulations and a few have used an ester-mineral oil blend. A lithium soap has been used universally as a gelling agent. The properties of the base oil and finished grease and a wide variety of successful uses for the latter have been described recently[4].

The viscosity-volatility characteristics of AN-G-25 greases are excellent, but several improvements have been incorporated in a new MIL specification, now in publication, to replace AN-G-25. The maximum apparent viscosity at —65 F. is set at 10,000 poises for a shear rate of 20 reciprocal seconds. This requirement will eliminate those AN-G-25 formulations which have apparent viscosities of 10,000 to 15,000 poises at —65 F. These higher viscosity formulations have received considerable criticism from certain equipment and airframe manufacturers. It was claimed that the higher viscosity AN-G-25 greases have prevented low torque equipment such as flea power motors and small actuators from operating at extremely low temperatures, thus defeating the weight saving program. Every complaint received has been examined carefully and, to date, no cases have arisen where one of the lower viscosity greases would permit equipment to operate at —65 F. and one of the higher ones would not. Either all AN-G-25 greases were satisfactory for an application or none were. This improvement in the low temperature properties in the new specification will not prove a hardship to grease makers and it will increase the margin of safety for low torque equipment. It should be noted that the viscosity limits of the new MIL specification will be in the same range as the now obsolete AN-G-3a greases[5].

The improvement in the low temperature properties has not resulted in any sacrifice in high temperature volatility

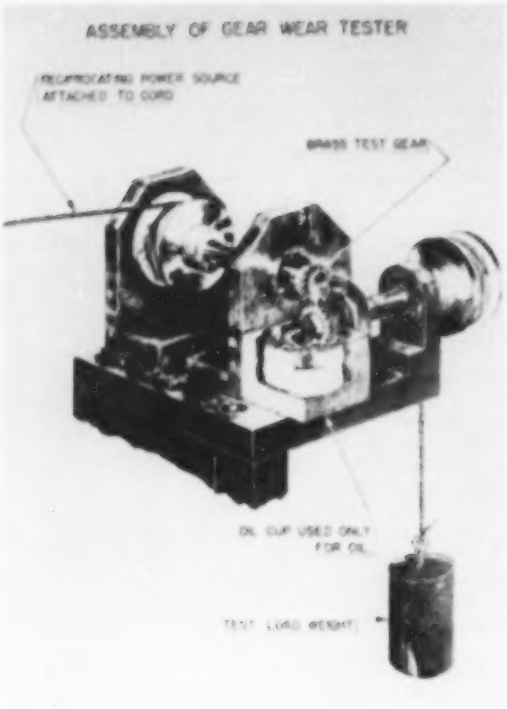
TABLE I.—COMPARISON OF GREASE PROPERTIES

Specification Requirements	*Spec.* AN-G-25	*Spec.* AN-G-15	*Spec.* AN-G-3a
Penetration (Worked 77° F.)	260 - 300	265 - 340	265 - 340
Dropping Point, min. °F.	325 ± 27	300° F ± 12.6° F	300° F ± 12.6° F
Evaporation, max. %	2		15*
Bleeding	5		5
Oxidation, psi Drop, max.	5 for 100 hr.	5 for 100 hr.	5 for 100 hr.
Worked Stability, Penetration After 100,000 Double Strokes in Grease Worker, max.	375	375	**
Aeration Test, Increase in Volume After Beating in "Mixmaster," max.	15 also no liquifaction or separation allowed	15 also no liquifaction or separation allowed	**
Apparent Viscosity, max. at —65° F. Rate of Shear—20 sec.	15,000 poises		†
Low Temperature Torque			
Temperature °F.	—65	—40	—65
Torque, gr-cm	2000	2000	2000
Seconds for one revolution of test bearing, max.	5	10	15
High Temperature Performance	Shall lubricate "204" test bearing for 1000 hr. at 250° F. and 10,000 rpm.	Shall lubricate "204" test bearing for 1000 hr. at 250° F. and 10,000 rpm.	**

* AN-G-3a Test is not as stringent as AN-G-25 test.

** Not required, but fails AN-G-25 requirement.

† Not required, but generally between 3000 and 10000 poises.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RECIPROCATING POWER SOURCE ATTACHED TO CORD
BRASS TEST GEAR
OIL CUP USED ONLY FOR OIL
TEST LOAD WEIGHT

Figure 1

Test rig for the evaluation of the lubricating properties of greases by means of determining the wear of a brass against a steel gear.

or performance. In fact the evaporation loss at 210 F. by ASTM method D-972-48T has been lowered from 2% to 1.5% for a comparable time period.

Control over wear properties has become a necessity in view of the large number of synthetic materials available today. The Air Force and the Bureau of Aeronautics have adopted a simple test method for the evaluation of the lubricating properties of greases by means of determining the wear of a brass against a steel gear. The test rig is shown in Figure 1. Typical data with this equipment are given in Tables 2 and 3[5].

The improved properties of AN-G-25 greases over the AN-G-3a greases insofar as sealed airframe control bearings are concerned in long term storage and use are brought out by experience obtained in Air Force overhaul depots. In preparing C-46 airplanes for operational service after 30 to 36 months of outside storage, it was found necessary to replace 50-75% of the airframe and surface control bearings originally lubricated with AN-G-3a. A recent survey of the airframe and control surface bearing replacement requirements of B-29 aircraft lubricated with AN-G-25 grease showed that only 10% replacement of the bearings was necessary after a similar storage and use history.

An extensive program in the corrosion protective qualities of greases under high humidity conditions has shown that all of the Specification AN-G-25 greases are not equal with respect to corrosion protective properties. Only one of the synthetics failed to afford satisfactory corrosion protection under field conditions and our condition of tests[6]. This is a grease using a polyoxyalkylene glycol diester as the oil component. The manufacturer has since made great improvements in formulation and current tests indicate that the latest formulation is acceptable from a corrosion standpoint.

E.P. GREASES

The higher operating temperatures of gear boxes, especially of actuators, prompted the desire of the services to raise the

Table 2. — Wear Rates for Greases in mg. Per 1000 Cycles[5].

Spec.	Grease Code	5-Lb. Load			10-Lb. Load		
		Mean Wear Rate	No. Runs Made	No. Gears Used	Mean Wear Rate	No. Runs Made	No. Gears Used
AN-G-3a	A	1.20	6	6	1.37	5	5
AN-G-10	B	0.95	6	6	1.11	4	4
AN-G-13	C	0.75	13	13	1.60	8	6
AN-G-25	D	1.30	39	17	2.04	15	15
AN-G-25	E	0.75	6	6	1.79	5	5
AN-G-25	F	0.46	12	6	0.96	10	10
AN-G-25	G	0.85	6	6	1.30	5	5
AN-G-25	H	0.91	4	4	1.02	4	4
Silicone	I	4.53	3	1			
AN-G-25 + E.P.	J	1.47	20	8	2.74	27	7
AN-G-25 + E.P.	K	1.01	5	5	1.79	6	6
Silicone—Diester	L	4.50	4	4			
Silicone—Diester	M	6.40	4	4			

TABLE 3 — WEAR RATES OF OILS IN MG. PER 1000 CYCLES*

Type	5-Lb. Load			10-Lb. Load		
	Mean Wear Rate	No. Runs Made	No. Gears Used	Mean Wear Rate	No. Runs Made	No. Gears Used
Lt. Petroleum Oil	1.04	16	11	2.54	4	4
Diester Oil	0.78	15	1	2.44	4	4
Ucon Oil	0.36	10	6	1.43	4	4
Ucon Oil + Add.	0.39	10	6	1.27	4	4
Dimethyl Silicone	6.50	5	5			
Phenyl Methyl Silicone	1.71	5	5	5.24	5	5

operating temperature of the extreme pressure grease, Specification AN-G-10. The high temperature limit of this grease for continuous operation is about 175° F. A series of simulated service tests were performed by NEES on an aircraft landing gear assembly using petroleum greases, diester greases, greases containing anti-wear additives and greases containing extreme pressure additives[1]. The results obtained indicate that AN-G-25 grease containing a suitable extreme pressure additive would meet the high temperature, low temperature and performance requirements of a grease for general use on aircraft gears, actuator screws and other equipment requiring a lubricant with a high load carrying capacity. Such a grease, while not intended for anti-friction bearing lubrication, could be used on bearings where equipment design requires the use of a single lubricant for both bearings and gears or screws. These results correlate generally with data obtained by the aircraft and equipment industries with tests in actual equipment. Typical data for one such grease are compared to the requirements of Specification AN-G-10 and the new MIL specification to replace AN-G-10 in Table 4. It may

TABLE 4.

COMPARISON OF AN AN-G-25 GREASE WITH E. P. ADDITIVE TO SPEC. AN-G-10 AND MIL SPEC. SUPERSEDING AN-G-10

Spec. Requirements	AN-G-10	MIL Spec. Superseding AN-G-10	Experimental Grease
Penetration, worked	310 - 385	280 - 346	296
Dropping Point, °F., Min.	300 ± 12.6	325° F. Min.	363
Evaporation, Max., %	15*	1.5% in 22 Hrs.	1.61
Bleeding, Max. %	5	5% in 30 Hrs.	5
Oxidation, psi drop, Max.	5 per 100 Hrs.	5 per 100 Hrs. 15 per 500 Hrs.	3
Worked Stability, Penetration after 100,000 double strokes, Max.	**	375 Max.	361
Apparent Viscosity, Max., at —65 F. Rate of Shear, 20 sec.⁻¹	†	15000 Poises	8300
Low Temperature Torque			
Temperature	—65° F.	—65° F.	—65
Torque, gr.-cm	2000	2000	2000
Seconds for one revolution of test bearing, Max.	30	5	4.5
Endurance Test, 10,000 rpm, 250 F., No. of hrs., Min.	**	1000	1718 2002 2832 2319
Pressure Wear Index, Min.	15		
Mean Hertz Load, Min.		25	34
Gear Wear Test		2.5 mg at 5 lb.	
Wt. loss per 1000 cycles		3.5 mg at 10 lb.	

* AN-G-10 test not as stringent as New MIL test.

** Not required, but fails MIL spec. requirements.

† Not required, but generally between 3000 and 10000 poises.

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***WITCO Aluminum Stearate No. 23**...medium high gel—excellent economy—all around good performance in a variety of oil stocks.

***WITCO Aluminum Stearate No. 22-E**...medium high gel—particularly suited for lower incorporation temperature.

WITCO Aluminum Stearate No. 22-C...very high gel—outstanding performance in Pennsylvania base and high viscosity index stocks.

WITCO Aluminum Stearate No. 22-G...an extremely high gel stearate which produces greases of excellent stability with a minimum tendency to bleed, together with excellent color and clarity.

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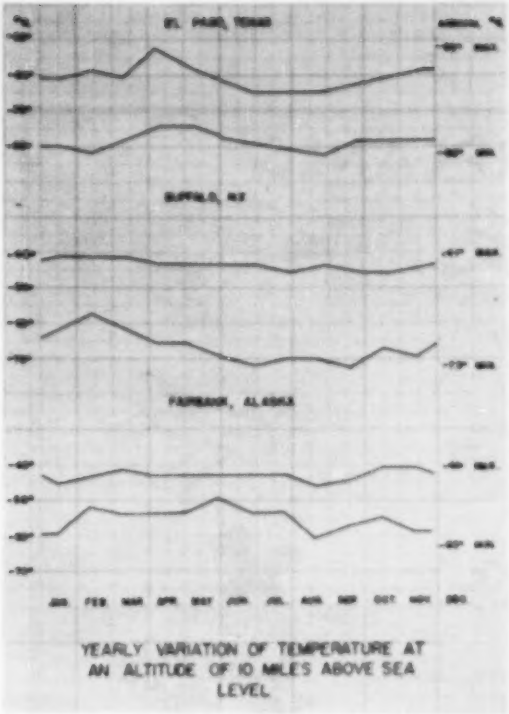

Figure 2 illustrates the maximum and minimum yearly variation in air temperature encountered at 10 miles above sea level in three localities.

be concluded from these data that this new specification could replace not only AN-G-10, but also AN-G-25, but there appear to be considerable objections, particularly from the bearing industry and the instrument companies, to the use of E.P. greases in anti-friction bearings. Further testing and evaluation may show that some of these fears may be groundless.

—100°F GREASES

It was stated previously by the authors[1] that the temperatures of —65 F. to —70 F. appeared to be the lowest aircraft will normally encounter. Temperature observations made at altitudes above 40,000 feet indicate that high altitude aircraft may have to operate at temperatures as low as —100 F.[2]. Figure 2 illustrates the maximum and minimum yearly variation in air temperature encountered at 10 miles above sea level in three localities. These curves are based on Weather Bureau data[3]. It is clearly shown that temperatures below —65 F. and as low as —100 F. are common above 40,000 feet. Figure 3 shows the minimum temperatures to be expected at altitudes up to 70,000 feet. Thus, while temperatures as low as —100 F. may be encountered at extremely high altitudes, the relationship between outside air temperature and equipment temperatures during flight remains to be established. Toward this end, flight tests are now underway to determine the need for lowering the current —65 F. requirement. Research and development work cannot await the outcome of these studies and the grease industry has been requested to develop suitable formulations of —100 F. greases in accordance with a proposed specification recently circularized by the Air Force. This action has been taken so that a suitable —100 F. grease will be available if the results of flight tests prove the need for such a grease. Even if these flight tests indicate no serious need for —100°F. greases, this grease may well be the answer for certain low Torque equipment now under development which

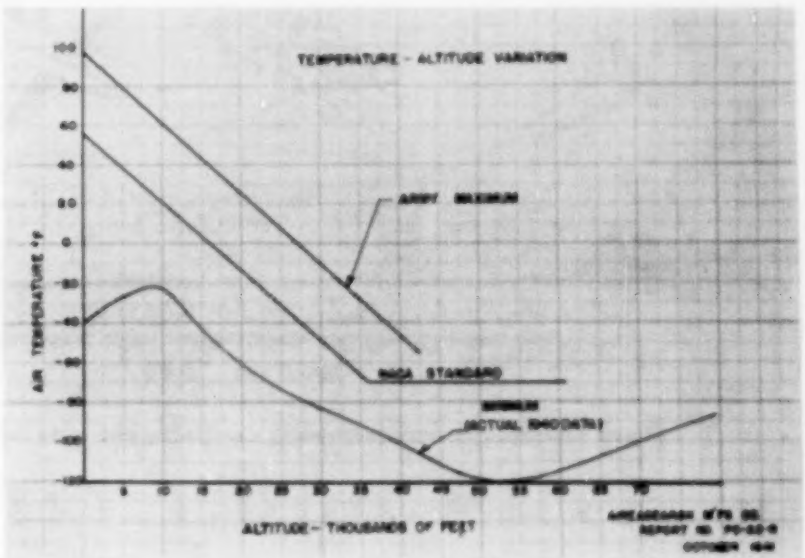

Figure 3 shows the minimum temperatures to be expected at altitudes up to 70,000 feet.

Figure 4 illustrates the dream airplanes as visualized by each of the design groups.

will not operate in the —65° F to —75° F range with the best low temperature AN-G-25 grease now approved under the specification.

The equipment which appeared to be the most critical on the airplanes involved were the linear actuators driven by 10 inch-ounce fractional horsepower motors. The first phase of the program was to establish the temperature limitations of the immediately available greases. A typical actuator was chosen as the test rig. This unit had low starting torque, but would operate dry or when lubricated with a very light oil at —100° F. Data for several greases at —65° F, —80° F, and —100° F. are shown in Table 5.

Grease J was prepared from formulation data in a Naval Research Laboratory report[5] and consists of a blend of adipate diester and silicone oil in approximately two to one weight ratio and appeared to have physical properties quite suitable for anti-friction bearing applications. However, lubrication tests of this grease and other silicone diester formulations on actuator jack screws showed that these greases suffered from the basic lubrication problem common to all silicone or predominantly silicone lubricants—the inability to lubricate steel on steel under load. Lubrication tests were conducted using the same actuator at room temperature. With the screw working against maximum design load, the screw became very hot after several cycles and the motor showed either excessive amperage draw or actually stalled. The normal diester greases will permit this same actuator to operate a minimum of 5000 cycles. Wear loss in the gear wear test discussed previously was 4.5 mg. per 1000 cycles at a 5 lb. load for grease J and 6.4 mg./1000 cycles for another adipate silicone grease. As noted in Table 2, these wear rates are of the same magnitude as the straight silicone greases. These data would indicate that some correlation does exist between the Navy Gear test and certain service equipment under simulated performance conditions.

Meanwhile, data on greases prepared in our laboratory and on greases submitted by various grease manufacturers indicate that it is entirely possible to manufacture a —100 F. grease using selected diesters. These materials may even meet the present AN-G-25 requirements, and also are suitable as a lubricant under conditions approaching boundary lubrication.

HIGH TEMPERATURE GREASES

Aircraft are being designed to fly further, higher and faster than ever before. The lubrication engineer is actually in a "no man's land" in the battle for space, weight and improved performance in aircraft of modern design. Figure 4 illustrates the dream airplanes as visualized by each of the design groups[1].

Equipment and components used on any airplane are a compromise between performance, space and weight. Therefore is is only natural that the Air Force has embarked on a program of miniaturization to develop smaller and lighter equipment with higher performance and with no consequent loss in reliability. This is one of the most important single design trends affecting grease development today. This trend will result in higher operating temperatures, lower starting torques, higher speeds and loads to which a grease will be subjected. The foremost advocates of miniaturization at the present time are the aircraft electronic engineers. Wenger[4] graphically outlines the advances made in the miniaturization of electronic equipment. Two examples, Figures 5 and 6, are

TABLE 5. — ACTUATOR TESTS AT LOW TEMPERATURE

Room Temp. Operating Time = 3.4 ± 0.2 sec.

Code	*Grease*	*Time for First Half Cycle*		
		—65° F	—80° F	—100° F
A	AN-G-3		18.2 sec	Inop —30 sec
B	AN-G-10	4.8 sec	20.5 sec	Inop —30 sec
C	AN-G-25	3.4	3.6	Inop —30 sec
D	AN-G-25	3.6	4.2	Inop —30 sec
E	AN-G-25		15.4	Inop —30 sec
F	AN-G-25	3.5	26.0	Inop —30 sec
G	AN-G-25	3.5	20.0	Inop —30 sec
H	Low Temp. Silicone	4.2	Inop —30 sec	Inop —30 sec
I	Low Temp. Silicone	3.2	3.8	Inop —30 sec
J	Silicone Diester		3.5	3.5
K	Silicone Diester			4.2

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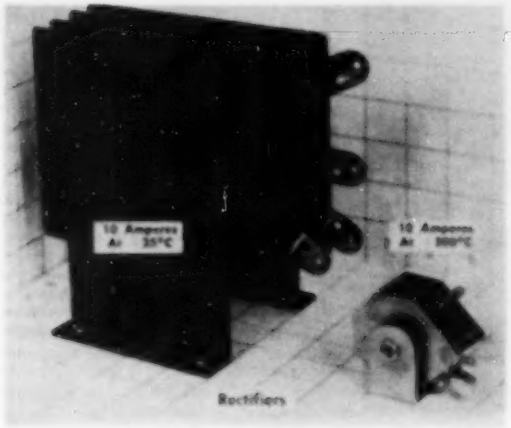

Figure 5

given to show the marked reductions in size and weight possible under such a development program. Such size and weight savings result in concentration of the heat load in a small volume and decreased rates of heat dissipation. As a result of this trend, the Air Force has established a design requirement of —65 C. to +200 C. (and possibly +250 C.) for aircraft electronic equipment now under development.

In addition to high temperatures resulting from miniaturization, similar effects result from the location of equipment near hot areas of the airplane. This particular problem has become most serious with the development of the turbo-jet aircraft and appears to be one that cannot be designed around easily. Control bearings and actuators in the immediate vicinity of the tail pipe are two of the more important applications where extremely high temperature greases appear necessary. Temperatures as high as +350° F. to +400° F. are anticipated in such applications. High temperature lubrication problems of very high speed aircraft and guided missiles must also be taken into consideration.

High skin temperatures of these aircraft and missiles have already indicated a need for development of higher temperature lubricants than are now available. Fortunately, however, the duration of flights of this equipment is relatively short and the requirements are not as stringent as with the high temperature applications resulting from miniaturization or from locations in the hot areas of the more conventional type aircraft.

The immediate objective of the Air Force is for a grease suitable from —40 F. to +400 F. with the ultimate aim for a grease suitable from —65 F. to +400 F. The need for wide temperature range greases is immediate in that we have applications on current production aircraft requiring such a grease, particularly for ball bearing actuators in the immediate vicinity of the tail pipe of certain jet installations.

The present high temperature grease, Specification AN-G-5a, is a soda soap, petroleum base grease. For continuous duty operation in equipment such as generators and alternators, this grease is limited to approximately 350-400 hours of life at 300 F. An increase in operating temperature of 25 F. causes a drop in life to about 200 hours and at 350 F., operating time, at speeds from 3600 rpm and greater, is approximately 50 hours. The low temperature properties of this grease in low torque equipment are extremely poor, being suitable only to 0 F. In engine driven equipment, however, this grease is suitable to —65 F.

By careful selection of oil stocks, soap and oxidation inhibitors, petroleum greases have been made which will last 1000 hours at 300 F. in the AN-G-5a endurance test. However, at 350°F., the life of such greases in this test is about 150 hours. In addition to being unable to increase the life of conventional petroleum greases at these extremely high temperatures, it has been impossible to widen the operating range of petroleum greases particularly due to the relatively poor volatility-pour point relationships of petroleum oils.

The 400°F. temperature represents a severe oxidizing condition for soaps and petroleum oils and the lines of improvement must follow along one or more of three avenues: (a) More stable base oils, (b) New gelling agents or (c) More effective oxidation inhibitors.

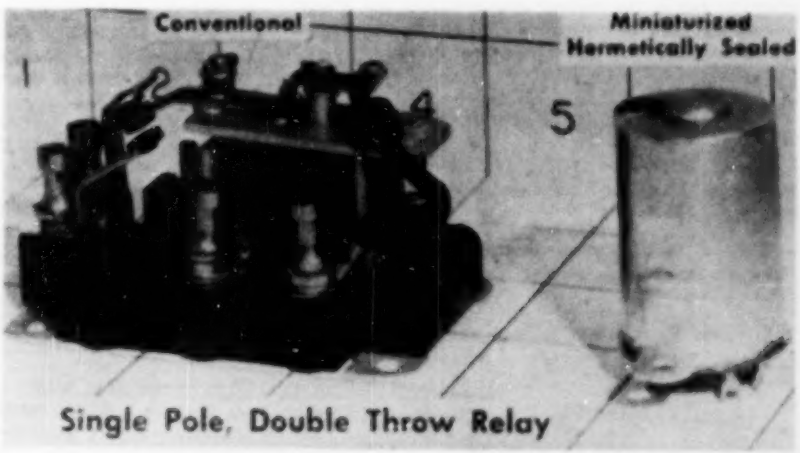

Figure 6

Figures 5 and 6 show the marked reductions in size and weight possible under the miniaturization development program.

The Convair B-36D, the jet-augmented version of the U. S. Air Force's intercontinental strategic bomber. Four GE J-47 jet engines, mounted in pairs under each outer wing edge, supplement six P&W piston engines. The B-36, long-nosed giant among U. S. Air Force bombers, measures 162 feet 6 inches from tip to tail and has a rudder which towers 46 feet above the ground. It has a maximum takeoff gross weight of 358,000 pounds, and at reduced range is capable of carrying a maximum bomb load of 84,000 pounds. With a 10,000-pound bomb load, it has a range of 10,000 miles. The B-36 is the largest land based bomber, requires a crew of 15 with a relief crew of four, and is considered the backbone of the present-day Air Force bombing mission.
—*U.S.A.F. Air Material Command Photograph*

The use of silicone greases in extremely high temperature applications is a matter of record and recent tests conducted by the Bureau of Aeronautics indicates that 400-500 hours at 400 F. and 10,000 rpm to be a distinct possibility. Another instance of improved performance through the use of synthetic greases is illustrated by a grease made with a soda soap and polyester oil. This experimental grease ran for 2000 hours compared to 1000 hours for the previously mentioned petroleum greases. This grease likewise had a low temperature torque of 9.8 sec per revolution at —50 F. under 2000 gm-cm load. The petroleum grease under comparable conditions gave 9.0 sec per revolution at 0 F.

Other synthetic greases containing suitable antioxidants also show promise at these high temperatures. Recent investigations have also shown that a good gel structure can be obtained with carbon black, silica, treated bentonite clays[13] and organic pigments[14]. Fitzsimmons et al.[14] report that a copper phthalocyanine-silicone grease has run as high as 200 hours in 204 series bearings in the Texas Company designed Pope spindle tester at 390 to 430 F.

Synthetic oils, non-soap gelling agents and new oxidation inhibitors such as the phenothiazine derivatives and dilauryl selenide may hold the answer to the Air Force's requirements for an extremely wide temperature range grease.

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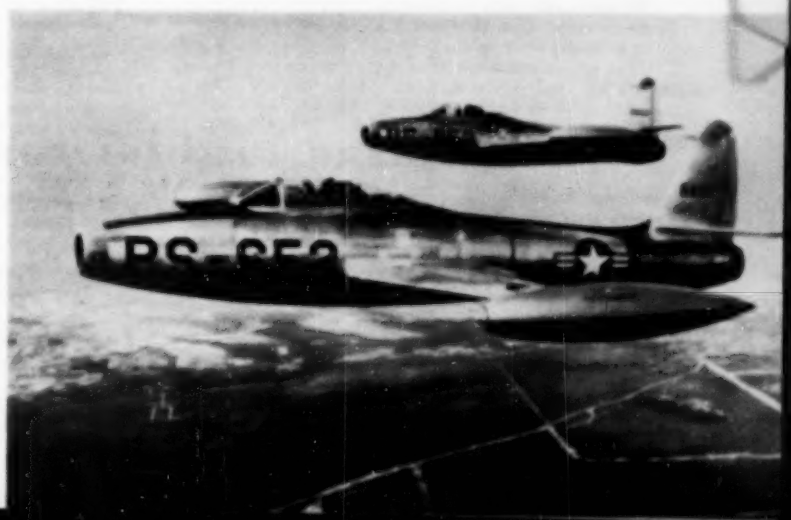
DISCUSSION

by
Dr. D. F. Wilcock
General Electric Company

This excellent paper points out the usefulness of the growing tendency toward the incorporation of functional tests in specifications for lubricants. This trend has been brought about in part by the inability of physical and chemical tests to predict adequately the performance of lubricants and, in part, by the continued development of reliable and reproducible functional tests. The development of these functional tests is one which has been fostered over the years by the American Society for Testing Materials and in some instances by the C. R. C. Two of the functional tests described in the paper are in a state of extension or further development, namely, high-temperature ball bearing life tests of greases and low-temperature starting torque behavior of greases. The present low-temperature torque determination has been subject to some critical comment by the aircraft accessory manufacturers because it does not represent the starting torque required to overcome the initial resistance of the grease and, hence, does not in some cases differentiate between good and poor greases. Technical Committee G of A. S. T. M. D-2 is at present engaged in the development of a suitable test method for determining the starting torque of greases at low temperature. The method under consideration, while not yet completely satisfactory so far as reproducibility between laboratories is concerned, has successfully differentiated between good and poor representatives of the ANG-25 class of grease. This distinction has been valuable to accessory manufacturers who must provide sufficient starting torque in tiny motors to overcome the grease resistance in the motor and other bearings of the equipment, which in small equipment may be the primary load. Another problem which arises is the difference between successive batches of the same product, both of which presumably meet the specification. A successful functional test provides a means of checking each shipment of grease to see whether it will be satisfactory for the critical items. The tightening of the ANG-25 specification upon conversion to the new MIL specification seems to be a step in the right direction, and the attainment of improved functional tests such as the starting torque test should in the future provide further improvement.

The development of greases which will be operable at —100°F is suggested as probable in the paper. With a very careful formulation the authors indicate that an ester-base grease can be made which just barely fulfills the requirements. On the other hand, they indicate that greases based on silicone oil which would be far superior torque-wise, as well as at high temperatures, are lacking in the ability to lubricate gearing, as indicated by the functional Navy gear wear test. As a functional test the gear wear test gives indications of being quite reliable and reproducible; and, on the unit in use in our Laboratory, results very similar to those given in the paper have been obtained. However, the specification calls for the use of gear materials of stainless steel and brass—two of the poorest materials from the standpoint of ease of lubrication. Doubtless, they were chosen for this very reason rather than for their common use in actuators and such equipment. As is well known today, from work done by the Naval Research Laboratory, the Dow Corning Corporation, and the General Electric Company, lubrication with silicones is subject to its own rules, so far as choice of suitable rubbing materials is concerned, just as are petroleum oils with whose limitations we are so familiar that we regard them as axiomatic. Thus it should be possible to find a wide range of suitable gear materials which would perform successfully with silicone-base greases without seriously limiting the equipment manufactured. Some preliminary tests with the Navy gear wear tester, using gears made of materials commonly used in our actuators and gearing, have shown remarkable success for lubrication by silicone greases, as well as by diester greases. Therefore, in order to obtain the best possible low-temperature performance combined with superior high-temperature performance, it might be appropriate to modify the proposed specification somewhat by decreasing the maximum permissible torque at low temperature and specifying a more suitable pair of materials for the gear wear test. This would tend to encourage the development of the optimum in light weight equipment capable of performance over the widest extremes of temperature conditions.



WRIGHT-PATTERSON AFB, DAYTON, OHIO — Republic's F-84 Thunderjet is the first American jet fighter to fly 600 miles an hour as standard performance. Its Allison turbojet engine has improved fuel consumption and enables the plane to climb from sea level to 40,000 feet in eight minutes. The Thunderjet is so versatile it can participate in ground support operations, as an interceptor, in low-flying spot bombing operations and penetration requirements. Its armament includes six 50-caliber machine guns, eight 5-inch high velocity aircraft rockets, 2000 pounds of bombs, two 100 or 500-pound fragmentation clusters, aircraft depth charges, incendiary bombs and napalm tanks. Combinations of these are used according to the mission desired.

—U. S. A. F. Air Material Command Photograph

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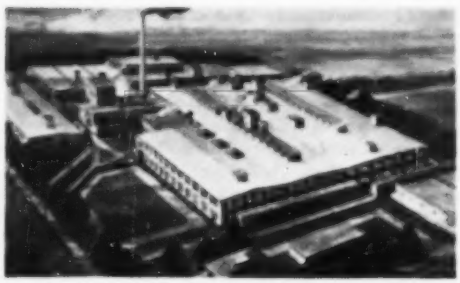

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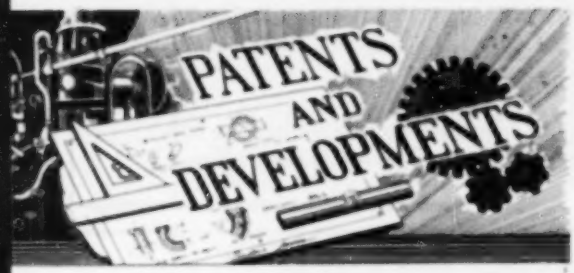


MODIFIED BENTONITE BASE GREASES

In recent months, new grease bases (Bentones) have appeared on the market for modifying grease consistency of lubricants without the use of soaps, these materials possessing the property of "having no melting point." A patent issued in this field to National Lead Company (U.S. 2,531,440) describes the production of bodied lubricants in which the grease-like consistency is produced by modified montmorillonite clay.

It is pointed out that certain colloidal exchange clays such as montmorillonite have basic exchange capacities in the order of about 25 to 100, based upon milliequivalents of exchangeable base per 100 grams of clay. It has been found that when such clays are treated with onium compounds, the onium base replaces the sodium ion in the sodium montmorillonite. For example, treatment with dodecylammonium hydroxide produces dodecylammonium bentonite, which has organophilic rather than hydrophilic properties and forms stable gels and colloidal dispersions in organic liquids. These swelling properties appear to reach a peak with respect to the amount of amine added, as can be seen from table I:

Amine/bentonite 50 me./100 g.	75/	100/	125/	150/	200/	300/
Swelling in nitrobenzene; ml	27.3	43.0	65.3	47.5	30.0	20.5	15.5

The procedure involved consists in dispersing the bentonite in water enabling the slurry to settle out non-clay impurities, which process discards about 10% by weight of the bentonite. Then glacial acetic acid is added to the amine (such as octadecadienylamine), and the amine salt is dissolved in warm water. Flocculation of the bentonite occurs upon addition of the amine salt solution, and the flocculent precipitate is filtered, washed, dried and pulverized. The octadecadienylammonium bentonite prepared in this manner can be mixed with S. A. E. 60 lubricating oil to the extent of 40% by weight to produce a viscous paste which can be diluted to 20% concentration in oil, giving a heavy translucent grease. The swelling test employed involves the use of nitrobenzene as the organic medium, and the claims specify that the onium clay swelling should be at least eightfold in nitrobenzene.

LUBRICATING GREASE CONTAINING PARAFFIN WAX

A soap-thickened lubricating grease having improved high temperature life, by reason of the inclusion of appreciable quantities of paraffin wax, is described in a patent issued to Standard Oil Development Company. (U.S. 2,534,053). Addition of about 2.5% wax is claimed to give an improvement of about 200 hours in spindle life. With synthetic ester base greases, spindle lives of 350 hours at 300° F. are claimed.

One example disclosed the preparation of a composition consisting of 14% combined soda and barium soaps of hydrogenated fish oil fatty acids, combined with 75.6% of a non-paraffinic treated Coastal distillate oil of about 500 S. U. S. viscosity at 100° F., together with 10% of scale wax from Panhandle crude oil, having a melting point of about 125° F., and 0.4% of phenyl alpha naphthylamine as an oxidation inhibitor. This grease is claimed to have performed satisfactorily in spindle tests at high temperature for 839 hours.

GREASE ANTIOXIDANTS

As an antioxidant for lubricating grease, a Standard Oil Development Co. patent (U.S. 2,533,989) proposes a resinous polymer product having mild inhibiting properties, with a known oxidation inhibitor, to augment the effectiveness of the latter and to cause the known inhibitor to exert a synergistic effect, thus improving lubrication of anti-friction bearings, etc. Resinous material is obtained by condensing an alkyl phenol, such as para-isooctyl-phenol, with formaldehyde, in the presence of hydrogenhalide acid. This resulting phenolic condensation product is thereafter reacted with a nitrogen base material such as ammonia, an amine compound, or the like, producing an oil-soluble compound, whose solubility increases with the length of the alkyl group in the phenol nucleus.

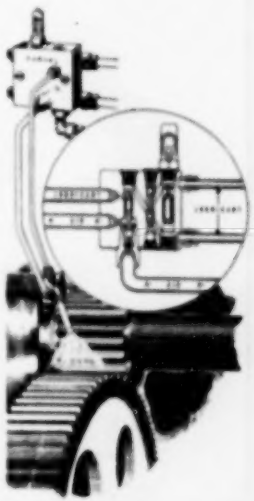
This material is employed in .5 to 3% concentration with known inhibitors such as phenyl alpha naphthylamine. The addition of 0.5% of the condensation product to 1% of the inhibitor almost triples the oxidation life of the grease.

NEW HORIZONS OF GREASE RESEARCH

The Texas Co. has published an article under this heading in its organ "LUBRICATION," for December, 1950. It takes up the mater of studying grease with the electron microscope, spectroscope, etc., using tools like the IBM Electronic Calculating Punch.

SPRAYER FOR APPLYING GREASE ON GEAR SURFACES, ETC.

The Farval Corporation of Cleveland is marketing a Sprayer which can be operated where compressed air is available for producing a spray of grease and other lubricants in desired amounts at any desired intervals of time. Details of the unit disclosed in the accompanying sketch. (Chemical Processing, December, 1950—Page 113).



GREAS-EVENTS

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CONTINUOUS GREASE MAKING PROCESS

A description of Esso Standard Oil Co.'s Continuous Grease Making Process at its Baltimore Refinery has been given. (Chem. Engineering, November, 1950—Page 285).

LUBRICANT VISCOSITY

Effects of Temperature and Pressure on the viscosity of lubricants are described by MacCoull. (Plant, November, 1950—Page 46-9).

GREASE ADDITIVE

Butren is an additive for oils and grease, claimed to reduce friction by as much as 88%. It is made by Trans-World Oil Company of Seattle. (Business Week, December 23—Page 31).

PATENTS

U.S. 2,533,425 (Phillips Petroleum Co.)—Allyl Chloride Polymer used as a Valve Lubricant.

BRITISH APPLICATIONS

32304/48 (Standard Oil Development Co.)—High Temperature Grease.

21085/49 (Standard Oil Development Co.)—Lubricant Grease Compositions.

ABOUT THE COVER

(Continued from page 4)

ping container, an easier, cleaner, more efficient method of filling grease guns. The Grease Gun is simply inserted through the "U-Press-It" opening in the cover of the pail. It fits into the opening in the follower plate, and a slight downward pressure on the gun then releases the plate from the cover. As more pressure is applied and the gun handle is withdrawn, the grease is quickly and uniformly forced into the grease gun barrel.

Plain Grease Pails in 25-Pound and 50-Pound sizes with either Lug Covers or Band Seal Closures are also manufactured by the Inland Steel Container Company. The Inland "Por-Pail" line of containers for liquid lubricants is available in a variety of sizes with different types of pouring spouts.

The Inland Steel Container Company, whose main office and plant is at 6532 So. Menard Avenue, Chicago 38, Illinois, also has plants in New Orleans, Louisiana, and Jersey City, New Jersey, where similar pails and drums are manufactured.

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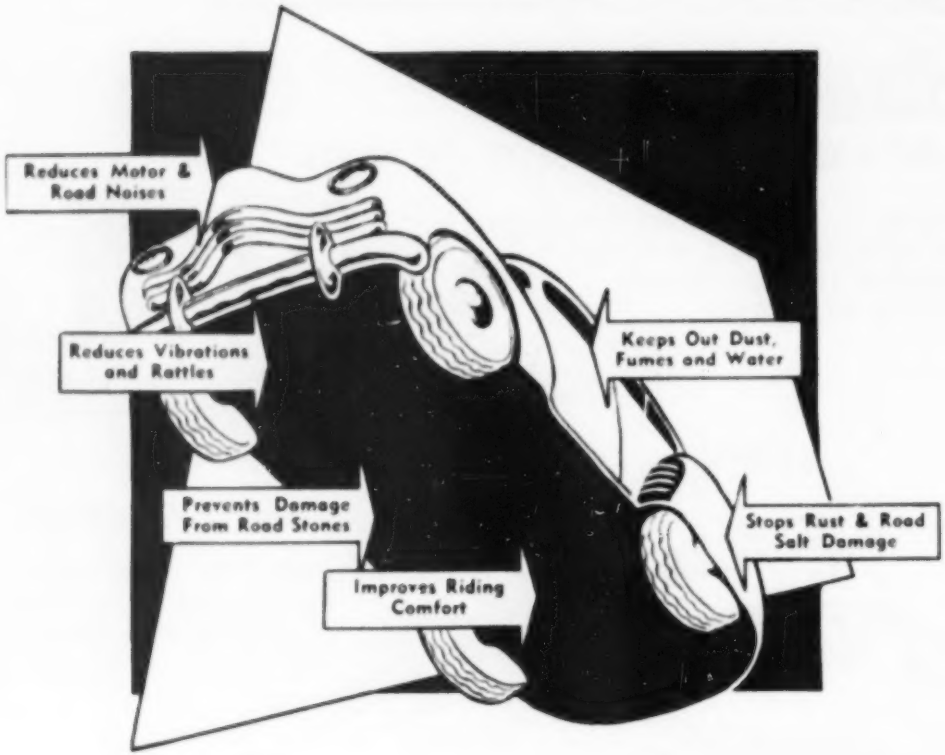
Reduces Motor & Road Noises
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Improves Riding Comfort
Keeps Out Dust, Fumes and Water
Stops Rust & Road Salt Damage

EVERY GREASE RACK IS A SALES OPPORTUNITY

Your garage and service station customers, with lubrication racks, can easily see the extra profits in **Under Frame Coating**. Many are now capitalizing on this profitable market . . . buying coatings from your competitors.

Don't let competition get their "foot in the door." Protect your grease sales and make extra profits by selling the world's finest **Under Frame Coating** under your own private brand. It's easy for you to sell **Under Frame Coating** right along with your lubricants. There's no need to stock large inventories — Battenfeld will ship direct to your customers. A sample of **Under Frame Coating** in the hands of your salesmen will bring surprising results.

Your grease customers already have the hoist and air pressure available . . . it takes very little investment for them to enter the **Under Frame Coating business**. And with a mark-up as high as 500% over material costs they cannot afford to pass up this money-making opportunity.

Both you and your customers will benefit. Write today and let us prove that **Under Frame Coating** is the perfect sales companion for your regular lubricating grease line.

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GREASE & OIL CORPORATION
Kansas City, Mo. — Minneapolis, Minn.
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"Business Is Improving"

GREASONALITIES

G. A. Olsen

OLSEN ELECTED N.L.G.I. DIRECTOR

G. A. Olsen, President of Sunland Refining Corporation, has been elected a new Director of the N.L.G.I. The election took place at the November Board of Directors meeting in Detroit, Michigan. Mr. Olsen replaces E. V. Moncrieff, who passed away November 5, 1950.

In addition to the N.L.G.I., Mr. Olsen is a member of the American Petroleum Institute Lubricating Committee, the American Oil Chemists Society, the Society of Automotive Engineers, the American Society of Lubricating Engineers, the Industrial Committee of the Fresno County Chamber of Commerce, the Jonathan Club of Los Angeles, and other organizations.

The early years of Mr. Olsen's life were spent on a ranch near Denver, Colorado. Upon returning from service in the Army during World War One, he was employed by the Union Oil Company of California for several years. He resigned to go into business for himself in partnership with A. W. Gearhart. They operated as the Sierra Oil Company, which was later changed to its present name, Sunland Refining Corporation. Presidency of the corporation was assumed by Mr. Olsen several years ago upon the retirement of his partner.

A happily married man, Mr. Olsen has three children, a daughter and two sons, and three grandchildren. The family enjoys membership in the Sequoia-Sunnyside Country Club where, our newly elected Director says, "I occasionally try to hit a golf ball without any great success."

DEEP ROCK'S VICE PRESIDENT ADDRESSES A.P.I.

Bernard L. Majewski, Vice President for Marketing, Deep Rock Oil Corporation, Chicago, Illinois, addressed the Thirtieth Annual Meeting of the American Petroleum Institute in Los Angeles on November 13, 1950.

The first part of the address, entitled "Our Responsibility to The American People in Peace and in War," was devoted to matters directly concerning the oil business. The latter part of his speech is a vital and inspiring message to Americans which has been reproduced in a booklet, entitled "Everybody's Business," with an introduction by Frank M. Porter, President of the A. P. I. The booklet also contains comments by the Honorable Oscar L. Chapman, Secretary, Department of the Interior, and W. Alton Jones, Chairman, Board of Directors, A.P.I.

In this talk, Mr. Majewski has set forth a dramatic challenge to Americans to accept the full individual responsibility of their citizenship. Requests for this booklet may be handled through your N.L.G.I. office.

LUBRICATE WITH "TOUGH" GREASES ALL YEAR 'ROUND

One easy stroke of hand lever dispenses Lithium, Barium and heavy soda base greases in coldest weather. Heavy-duty Gro-Zer-Ator fills 35- to 40-lb. standard grease containers and has 10-ft. wire braid hose. Dispenser-booster assembly develops 7,500 lbs. pressure and supplies enough grease to fill 100 bearings, or entire pail of grease can be dispensed by holding booster valve open and operating pump handle.

Precision workmanship—fully guaranteed.

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812 North Main St. - - Wichita, Kansas

STEWART-WARNER APPOINTS PRESIDENTIAL ASSISTANT

Leonard L. Robb, who joined Stewart-Warner Corporation, Chicago, in 1928 as a stock record clerk, has been appointed assistant to James S. Knowlson, president and board chairman of the company. Since 1942 Robb has been production control manager of the lubrication equipment and automotive accessory division of Stewart-Warner. He was graduated from Harvard in 1925.

Penn-Drake Petrolatums

Pure Dark Grades For the Grease Maker

To maintain the uniformity and high quality of your greases, specify Penn-Drake Petrolatums. Made of 100% pure Pennsylvania Crude, they will not melt, sweat or become "runny" even at high summer temperatures. May we send specifications or samples?

PENNSYLVANIA Refining Company

Butler, Pennsylvania

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QUALITY GREASE MAKING

- Neutral Oils
  Viscous and Non-Viscous
- Bright Stock
- "G" Cylinder Stock

UNIFORM, DEPENDABLE

Write today for samples and prices

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AERO® BRAND STEARATES

your key to improved grease performance

High gelling in lube oils and other solvents
Exceptional gel strength
Excellent stability
Excellent resistance to mechanical breakdown

Packed for your convenience and protection in multi-wall bags, produced in volume by a modern, continuous process plant, AERO Brand Stearates are widely used. Here are some of the advantages of a typical AERO Brand Stearate, Aluminum Stearate Grease Grade.

On your next order specify AERO Brand Stearates for greater grease and lube efficiency.

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30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.
In Canada: North American Cyanamid Limited, Toronto and Montreal

Ralph R. Matthews

MATTHEWS IS NEW SECRETARY FOR OIL COMPOUNDERS ASSOCIATION

President Fred H. Helling of the Independent Oil Compounders Association has announced that Ralph R. Matthews, retired Executive Vice President of the Battenfeld Grease and Oil Corporation, has agreed to become executive secretary of the organization. Prior to his association with Battenfeld, Mr. Matthews was with Shell Oil Company in the capacity of laboratory chemist, including Chief Chemist of the Wood River Illinois refinery, Assistant Superintendent and finally the organizer and director of their Lubrication Department in St. Louis, Mo.

Matthews has been active in the following organizations and societies; the St. Louis section of the American Chemical Society and its Petroleum Division, Committee D-2 of the American Society for Testing Materials, a section of the Society of Automotive Engineers, The National Lubricating Grease Institute and its Technical Committee, the Lubrication Committee of the American Petroleum Institute, and the American Society of Lubrication Engineers. His activities in these organizations have included several positions as an officer or on committees. Numerous papers under his name have appeared in oil industry publications and he has spoken on lubricating greases and lubricants at many meetings of state and national organizations.

The Independent Oil Compounders Association was organized in the spring of 1948 at a gathering of Oil Compounders in St. Louis, Mo. The first annual meeting was held October of that year in Chicago, Illinois. From the beginning keen interest in the association has been exhibited by the oil industry.

Oil Compounders have long been recognized as an essential and important part of the oil industry. Essentially their name is derived from the fact that they have proper facilities for blending and compounding motor oils, industrial oils, gear lubricants, and petroleum specialties. Some also manufacture certain types and grades of lubricating greases.

Quoting from the By-Laws the purpose of the Association is as follows: "The objects of this Association shall be to promote the social, scientific and economic welfare of the Independent Oil Compounders, and to promote free enterprise and to encourage fair trade practices throughout the entire industry." One of the outstanding objectives of the Association is to encourage and aid, as far as possible, further technical developments so the very best lubricating oils can be supplied to customers. Naturally another prime objective is to enhance, through the Independent Oil Compounders Association, the excellent reputation and standing which the Oil Compounder now has in the Oil industry.

AMERICAN LUBRICANTS, INC.

Buffalo, N. Y.

SERVICE and GREASES from a CENTRAL POINT

NILES

Steel Pails and Drums

FOR OILS, GREASES, ETC.

No. 9 Niles Pail with lug cover and pour spout.

NILES STEEL PAILS

ordinarily are supplied with bail handles. Fabricated from black steel—outside painted or lithographed to order. Removable tops with lug covers, with or without pour spouts. Also in tight head style. 3½ to 6 gallon capacities.

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NILES STEEL DRUMS

55, 30 and 15 gallon capacities; and 100 lb. grease drums. Full open head or Bung type. Painted or fully decorated. Interior lacquered if desired.

100 pound Niles Grease Drum. With 9 inch opening as shown at left open top.

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REPUBLIC STEEL CORPORATION • NILES, OHIO

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Travis V. Rankin

NOPCO CHEMICAL COMPANY PROMOTES TRAVIS V. RANKIN AND JOHN N. GAMMON

On January 1, 1951, Travis V. Rankin became District Manager of the Central Area for Nopco Chemical Company. Mr. Rankin, a graduate of the Illinois Institute of Technology, joined the Nopco organization in 1936. Following a year's work on a special project in the company's Chicago laboratories, he was made sales representative in the southwestern territory of Texas, Oklahoma, Kansas and Missouri. For four years during World War II, Mr. Rankin served with the U. S. Air Forces and holds a commission as a lieutenant colonel in the Inactive Reserve at this time.

In taking over as District Manager of the Central Area, Mr. Rankin replaces John N. Gammon recently transferred to the south. He will be in full charge of the company's present field force in the area and will be responsible for sales of the broad line of chemical specialties manufactured by the Nopco Industrial Division. He will also be responsible for sales of the stearates and palmitates produced by Metasap Chemical Company, a wholly owned Nopco subsidiary.

The Central Area which Mr. Rankin will supervise comprises the states of Michigan, Ohio, Indiana, Kentucky, western Pennsylvania and the western half of West Virginia.

Effective at once, John N. Gammon becomes Southern District Manager for Nopco Chemical Company of Harrison, New Jersey, and Cedartown, Georgia. In taking over the southern territory, Mr. Gammon replaces George H. Small, who passed away last October 12. He will be in charge of the company's present field force in the south and will be responsible for sales of the entire line of chemical specialties manufactured by the Industrial Division of Nopco, as well as those of the metallic soaps produced by Metasap Chemical Company.

Mr. Gammon was graduated from North Carolina State College, Raleigh, North Carolina, in 1931 and holds a bachelor of science degree in Textile Manufacturing from that school. He joined the Nopco organization immediately after his graduation and spent almost two years in the company's Harrison laboratories and plant. Mr. Gammon then spent five years in the Harrison sales office where he was an assistant in the Metasap division and later headed the Specialties Sales Division. In 1938 he went on the road as a sales representative for Nopco and Metasap in the Ohio-Michigan-Indiana area and has been district manager there since 1946.

Nopco's southern district comprises the states of Tennessee, South Carolina, Georgia, Louisiana, Mississippi, Alabama and Arkansas. Mr. and Mrs. Gammon and their three daughters plan to make their home in Cedartown, site of the company's southern plant and warehouse.

Announcements of these promotions were made by G. D. Davis, Vice-President in Charge of Industrial Sales, from the company's home office at Harrison, New Jersey.

1951 - FUTURE MEETINGS OF YOUR INDUSTRY

FEBRUARY, 1951

20 A.S.T.M. (Philadelphia District Meeting). Subject: Principles & Techniques in Developing Engineering Alloys & Processes, Philadelphia, Pa.

20-21 Kentucky Petroleum Marketers Assn. (annual meeting, convention, and trade show), Brown Hotel, Louisville, Ky.

27-28 Wisconsin Petroleum Assn. (annual convention and equipment show), Milwaukee Auditorium, Milwaukee, Wisc.

MARCH, 1951

5-7 Manufacturers Standardization Socy. of the Valve & Fittings Industry (annual meeting), Commodore Hotel, New York, N. Y.

6-8 Socy. of Automotive Engineers (passenger car, body, and materials meeting), Hotel Book-Cadillac, Detroit, Mich.

7-8 National Oil Jobbers Council (spring meeeting) Shamrock Hotel, Houston, Texas.

7-9 AMERICAN PETROLEUM INSTITUTE (Division of Production, Southwestern district meeting) Hotel Beaumont, Beaumont, Texas.

8-9 Indiana Independent Petroleum Assn. (spring convention and refiners and suppliers exhibit), Hotel Severin, Indianapolis, Ind.

9-10 Texas Oil Jobbers Assn., Inc., (spring convention and refiners & suppliers exhibit), Shamrock Hotel, Houston, Tex.

13-15 Illinois Petroleum Marketers Assn. (annual convention), Sherman Hotel, Chicago, Ill.

20-22 Ohio Petroleum Marketers Assn. (annual convention and marketing exposition), Deshler-Wallick Hotel, Columbus, Ohio.

APRIL, 1951

2-5 The American Socy. of Mechanical Engineers (spring meeting), Atlanta-Biltmore Hotel, Atlanta, Ga.

5-10 National Tank Truck Carriers, Inc. (mid-year meeting), Boca Raton Club, Boca Raton, Fla.

9-10 A.P.I. Lubrication Committee, Detroit, Mich.

10-11 Michigan Petroleum Assn. (annual spring convention), Detroit Leland Hotel, Detroit, Mich.

SUPPLIERS OF MATERIALS FOR MANFACTURING LUBRICATING GREASES

Cottonseed Fatty Acids
Tallow Fatty Acids
Stearic & Oleic Acids

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105 MADISON AVE. N. Y. 17
FACTORY: NEWARK, N. J.

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(liquid & solid)
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ALUMINUM STEARATE
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and all other Metallic Soaps
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Laboratory and production models save material, cut cycle time, make better product
PROVEN RESULTS
CHAFFEE DESIGN & MFG. CO., INC.
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LUBRICATE
FOR SAFETY
EVERY 1,000 MILES

NEWS About Your Industry

Graco's Mogul-Type Powerflo Pump

GRACO ANNOUNCES POWERFLO PUMP

The Gray Company, Inc., Minneapolis, Minnesota, has announced its new Graco Mogul-Type Powerflo Pump, which, according to the company, completely eliminates spray gun spurting, which often projects a blob of heavy industrial material upon the coated surface. This air-operated, high volume, material handling pump is equipped with a device called the Evenflo which prevents spurting, says the company. Surfaces can be coated evenly to meet rigid specifications.

Mogul Pumps—operating in original 400-lb. and 100-lb. drums or in bucket-type containers — supply industrial material through hoses for spray gun, pole gun or extrusion gun application. Time-wasting transfer operations are not necessary, says the Gray Company.

Extra high volume Mogul Pumps operate within an air pressure range of from 20 to 175 PSI, can be powered by air compressors with either large or small output capacities.

The company claims that rust and corrosion preventives, calking compounds, adhesives, sound deadeners, roofing materials, undercoaters, and many other industrial materials are pumpable faster and in greater volume with the new Graco Mogul, and that gummy mastics, and other non-self-leveling substances, can be easily handled.

Moguls weigh 35 lbs. Power head is cast aluminum. Air motor incorporates steel forgings and machined castings; large poppet valves for greater efficiency. Easily changed O-Rings stop blow-by to provide leakproof seals in air motor, says the company. Piston has balanced double action for smooth high volume delivery. Moguls are simple in design and construction, can be serviced easily.

For more information, write Gray Company, Inc., Industrial Division, Graco Square, Minneapolis 13, Minnesota.

T. C. THOMSEN WRITES ENGINEERING MANUAL

A new 1951 edition of THE PRACTICE OF LUBRICATION by T. C. Thomsen has just been published by the McGraw-Hill Book Company. This engineering manual takes up the origin, nature and testing of lubricants — their selection, application and use — providing thorough coverage of all factors involved in correct lubrication procedure. It analyzes numerous typical lubrication problems from an engineering standpoint, and points out the appropriate solution for each of them.

THE PRACTICE OF LUBRICATION covers all significant advances in the science of lubrication that have accompanied recent developments in engine and machinery construction, including those made in aeroengines and aircraft accessories. New achievements involving the distillation and refining of lubricating oils, the manufacture of inhibitives, or additives, to improve the performance of a variety of oils and lubricants, and solvent refining processes are but three of several important highlights in this new fourth edition. Other important developments discussed include the ever-widening field of synthetic oil production and use, and the increasing use of rubber, press metal and fiber bearings.

T. C. Thomsen, now an independent consulting lubricating engineer, is an internationally recognized authority in his field. For many years he was Chief Engineer to the Vacuum Oil Company, Ltd., London, and Research Engineer to the Anglo-Mexican Petroleum Co., Ltd.

THE PRACTICE OF LUBRICATION is priced at $8.00 and can be purchased from the N.L.G.I.

Laboratory improved and tested

AUTOMOTIVE LUBRICANTS • GREASES AND CUTTING OILS

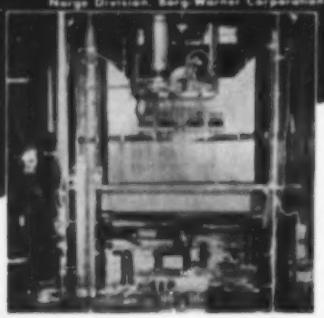
PENOLA OIL COMPANY

15 West 51st St., New York 19, N. Y.

"No further breakdowns since installing

Lincoln CENTRALIZED Lubrication Systems"

Wm. S. Draper, Maintenance Division
Norge Division, Borg-Warner Corporation



350-ton Hydraulic Draw Press

PROBLEM: "Four years ago, we purchased a 350-ton hydraulically operated draw press. After only a few weeks operation, we were forced to tear this press down and scrape the ways of the bed cushion. After a few more weeks of operation, the bearings on the guide posts for upper ram started galling, causing another shutdown and re-machining operation.

SOLUTION: "Then we decided to install a Lincoln Centro-Matic® Lubrication System.

RESULTS: "A year later, we purchased a similar press of 550-ton capacity on which we installed a Lincoln Centro-Matic Lubrication System. We did this before operating the press with the result that we have never had to do any work on ways or guide posts of this press.

"Our next installation was on an hydraulically-operated bending machine used for forming outer shell of the refrigerator. After ways on this machine started to score, we were obliged to shut down while we did extensive scraping of the ways. Needless to say, we immediately installed our third Lincoln Lubrication System, with the same satisfying results."

Wm. S. Draper, Maintenance Division
Norge Division, Borg-Warner Corporation

Apply THE RIGHT LUBRICANT IN THE RIGHT QUANTITY AT THE RIGHT TIME

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Lincoln's Lubrication System specialists will work with you and recommend the time and money saving Centralized Lubrication System best suited to your equipment. Phone or write

LINCOLN ENGINEERING COMPANY, 5702 Ml Natural Bridge Ave., St. Louis 20, Mo.

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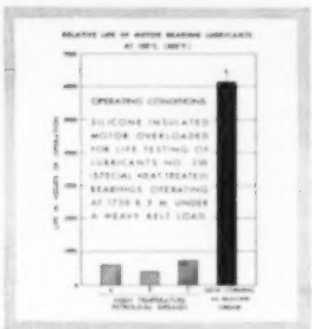
Silicone News

IN THE BEARINGS OF ELECTRIC MOTORS

DOW CORNING 44 SILICONE GREASE CAN SAVE INDUSTRY

$45,000,000.00 A YEAR!

Count the number of conventional-type motors you have in your plant. Multiply that number by $4.52 and you have the average yearly cost of lubricating these motors plus the cost of motor failure caused by improper lubrication. That cost is based on a carefully conducted study of motor lubrication and outage costs due to bearing failure in a variety of industrial plants across the country.


OPERATING CONDITIONS
SILICONE INSULATED MOTOR OVERLOADED FOR LIFE TESTING OF LUBRICANTS NO. 2M (SPECIAL HEAT TREATED) BEARINGS OPERATING AT 1750 R.P.M. UNDER A HEAVY BELT LOAD

With an estimated 10 to 15 million motors now in service, American industry spends 45 to 67 million dollars a year that might be saved by the use of Dow Corning 44 Silicone Grease. That possibility is based on the performance of this Dow Corning Silicone grease in about half a million cartridge ball bearings used in a widely advertised line of industrial motors. Experience has proved that these bearings, prelubricated for life with Dow Corning 44, require no further attention.

That confirms the testing done by Dow Corning, by bearing manufacturers and by the military establishment. Data such as that shown above indicate that you can expect Dow Corning 44 Silicone Grease to last at least 10 times longer than high temperature petroleum greases.

For more information about Dow Corning Silicone Greases, phone our nearest branch office or write for data sheet N-1.

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In Canada: Fiberglas Canada Ltd., Toronto
In Great Britain: Midland Silicones Ltd., London

FIRST in Silicones

Dow Corning

This new Speed-Flo Transfer Pump, Model 82230, transfers fluids at 22 gallons per minute.

LINCOLN MANUFACTURES NEW PUMP

The Lincoln Engineering Company, St. Louis, manufacturers of equipment for the application of lubricants, announces the addition of a new, high speed, air-operated Transfer Pump to their line of transfer pumps to meet every requirement. This new Speed-Flo Transfer Pump, Model 82230, transfers fluids at 22 gallons per minute. It empties a 55-gallon drum of S.A.E. 30 oil in slightly over two minutes. It can be used for transferring lubricants, thinners, coolants, naphthas, non-corrosive chemicals and many other materials without spillage, mess or waste.

Model 82230 Transfer Pump fits all 2" opening drums. It has a built-in, disc-type, precision-flo regulator to permit finger-tip regulation of the volume of output. The Pump is of steel construction, yet weighs only 18 pounds.

For complete information, write for Bulletin No. 213, to Lincoln Engineering Company, 5702-80 Natural Bridge Ave., St. Louis 20, Missouri.

EMERY ANNOUNCES EXPANDED PRODUCTION

Emery Industries, Inc., announces the emergency expansion of oleic acid production to meet increased trade demand and government requirements. This increased production is in the form of a new single-distilled product, Emersol 212 Elaine, which is similar in all respects to Emersol 210 Elaine, except for a 4.0 maximum unsaponifiable and a 96% minimum free fatty acid content for Emersol 212 as compared to a 2.5 maximum unsaponifiable and a 97% minimum free fatty acid content for Emersol 210.

This deviation from normal quality will have only minor effect on many finished products. For these cases and where availability is paramount, Emersol 212 Elaine is recommended.

The expanded production of Emersol 212 Elaine supplements the production of regular single-distilled grades (Emersols 210, 211) the regular high-quality double-distilled grades (Emersols 220, 221) and of the premium-quality Emersol 233LL Elaine).

Samples of Emersol 212 Elaine are available upon request from Emery Industries, Inc., Department 5, Carew Tower, Cincinnati 2, Ohio, or from the following branch offices: 3002 Woolworth Bldg., N. Y. 7, N. Y.; 187 Perry St., Lowell, Mass.; 410 N. Broad St., Philadelphia 8, Pa.; 420 Market St., San Francisco 11, Calif.; and representatives: Clarence Morgan, Inc., 919 N. Michigan Ave., Chicago 11, Illinois; Ecclestone Chemical Co., 2673 Guoin, Detroit 7, Michigan; Schibley & Ossmann, Inc., 33 Public Square, Cleveland 13, Ohio.

The company also announces direct sales and technical service coverage of the West Coast area for the complete line of Emery Chemical products: Stearic Acids, Oleic Acids, other Fatty Acids, Plastolein Plasticizers, Twitchell Textile Oils and Soluble Oil Bases.

L. J. Hadobas has been appointed to handle this coverage and will operate out of a newly established branch office located at 420 Market St., Tilden Sales Building, San Francisco 11, California.

Warehouse stocks will be maintained to provide shipments of L.C.L. requirements to West Coast points.

FOOTE MINERAL COMPANY PRODUCES ZIRCONIUM FOR EXPERIMENTS

The Foote Mineral Company, of Philadelphia, has been making ductile zirconium commercially since 1942 in the belief that it would sometime find an application for its excellent properties of corrosion resistance, strength and weight and were in a position to provide the metal for the researchers. The metal has, in addition to its other properties, a relatively low tendency to capture neutrons and is, therefore, well adapted for use in atomic furnaces. Consequently, Foote is now under contract to produce, for experimental purposes, considerable amounts of zirconium for the U. S. Atomic Energy Commission.

Modern jet engines presented difficult metallurgical problems involving strength, weight and corrosion resistance at elevated temperatures, but the development of atomic power plants has added yet one more factor to contribute to the metallurgists' troubles and that is the problem of neutron capture by the materials of construction used in an atomic reactor.

FISKE BROTHERS REFINING CO.

Established 1870

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NEWARK, N. J.

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LUBRICATING GREASES

GULF

A Complete Line of Quality Oils and Greases

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how to make ingredients
"go farther"

Votator
GREASE MAKING APPARATUS

USERS OF VOTATOR Grease-making Apparatus report substantial reductions in the quantity of stearate required to make aluminum stearate lubricating grease, compared to batch methods. That's because the more thorough mixing action gives a greater dispersion of stearate through the oil.

VOTATOR Grease-making Apparatus processes continuously—always under precise, automatic control. Thus wastage encountered with batch mixing can be eliminated. Moisture content and temperature can be controlled accurately—your grease always processed as you specify.

VOTATOR Grease-making Apparatus can be applied for processing of many types of greases. Write now for case history facts. The Girdler Corporation, Votator Division, Louisville 1, Kentucky.

GIRDLER CORPORATION
Votator Division

VOTATOR T. M. Reg. U. S. Pat. Off.

All of the usual metals with good strength, corrosion and high temperature character have a similar appetite for neutrons and nuclear designers were forced to search for a new metal to help solve one of their many problems—a metal such as zirconium.

WITCO STREAMLINES COMPANY ORGANIZATION

Witco Chemical Company is broadening and streamlining its Technical Service Department to provide industry with more information on critical materials and substitutes in order to help offset shortages that lie ahead in its field; as well as to provide essential industry with the quickest possible service preparatory to, or during a national emergency, according to Robert I. Wishnick, president.

In close cooperation with Continental Carbon Company, producers of all types of carbon black sold exclusively by Witco, the move involves the shifting of responsibilities for research and technical service personnel and organization of specialist groups to afford both closer contact, and solution of customer problems as rapidly as possible.

Research and development will be centralized in the Chicago laboratories under the direction of Dr. Wilbur B. Pings, who will work closely with Dr. E. F. Wagner, former director of research, who is now director of the technical service.

Over a long period of years, Witco has developed specialists in various fields of activity, each of whom directs the activities of a group specializing in one particular field. These specialists are available to industry on a countrywide basis to assist in solving technical problems. The specialists are:

R. D. Wendt, on stearates.

Howard Packer, driers.

Konrad Parker, plastics and stabilizers.

H. R. Spielman, waxes and rubber chemicals.

George Freese, asphalt development.

Robert Kufrin, asphalt specialties and mastics.

Walter J. Tanner, carbon black applications with emphasis on ink.

Witco's technically trained salesmen, working out of the Boston, Chicago, Cleveland, Akron, Houston, San Francisco, Los Angeles and New York offices, will, as in the past, serve as quick sources of contact with the specialists, or the latter may be contacted through Dr. Wagner.

Vulcan's emergency substitute for the Standard ICC lug cover container.

NEW TYPE EMERGENCY CONTAINERS

A satisfactory new type container is now being made in 1 to 5 gallon capacities as a substitute for the widely used standard I.C.C. lug cover container. This new container has a tin plate body with hand soldered locked seams and with covers and bottoms of either tinplate or clear lacquered black plate. Lug covers are fitted with either tubular or flowed in gaskets and employ standard closing tools.

Fabricated in this manner from available materials, this type of container is quite frankly an emergency and substitute solution to the current container problem so common in many industries, and because of its method of manufacture, it is slightly more expensive than standard I.C.C. containers. It was originally developed during the last war and was widely used by industry when standard containers were impossible to obtain in any quantity. It has, therefore, been thoroughly tested and tried by many different product manufacturers. Found to be quite satisfactory for heavier and semi-solidified substances, it is not recommended for thin liquids.

Again being manufactured to meet an urgent need, this container has been quite generally accepted by industry in the present emergency and production is so satisfactory that containers are still available to manufacturers in carload or trailerload lots. L.T.L. shipments, however, are limited to the Chicago area because of the absence of cartons and the difficulty of packing.

Samples and further information may be secured from the manufacturer, Vulcan Tin Can Co., Bellwood (suburb of Chicago), Illinois.

SPOKESMAN BACK ISSUES

Spokesman readers are consistently requesting back issues previous to April, 1948. Just as consistently they have been refused because the stock of issues prior to this date is practically exhausted.

A New Method to Obtain Early Issues

To answer this demand the N.L.G.I. has microfilmed recent issues. It is possible that if sufficient demand is apparent very early issues dating back to its inception in 1937 can be microfilmed and preserved by readers. Volume XIV is completely microfilmed now and Volume XV should be available shortly after it is bound in April.

If you are interested in obtaining these early Spokesman issues just write:

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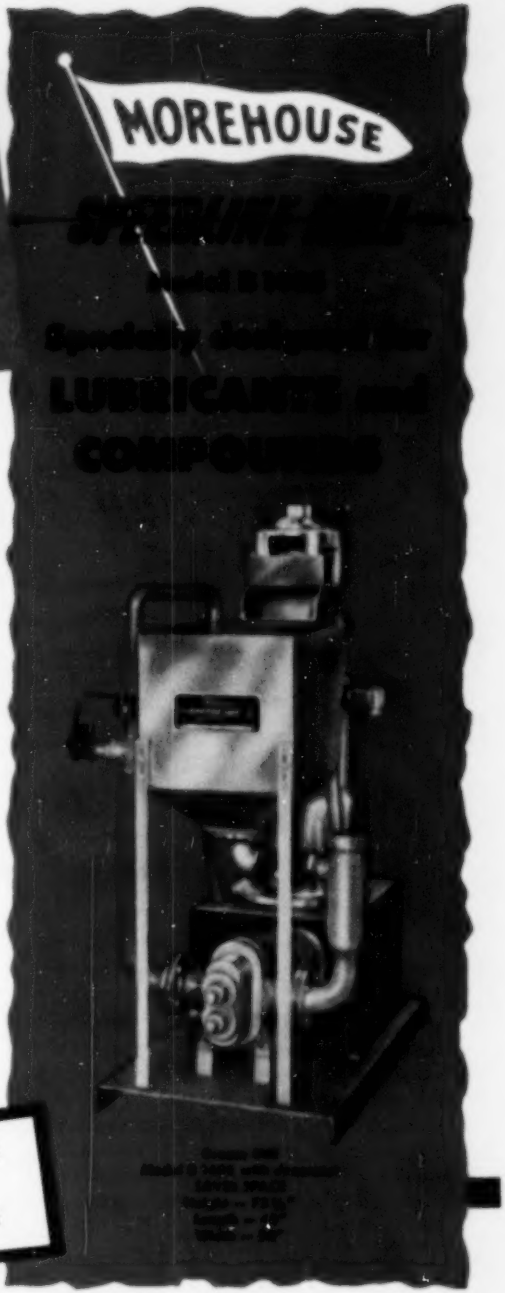

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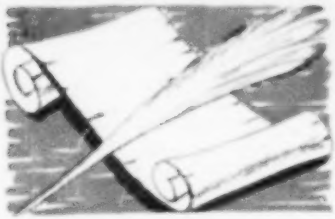

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